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MEDICAL REPORT.

April 19*th*, 1900.

Sir,

I have the honour to submit for the information of His Excellency the Governor and for transmission to the Right Honourable the Secretary of State, the Medical Report on the health and sanitary condition of the Gold Coast Colony for the year 1899, together with the Returns, &c., appended thereto.

I have the honour to be,
Sir,
Your obedient Servant,

(Sgd.) ALBERT J. CHALMERS, M.D., F.R.C.S.,
Acting Chief Medical Officer.

The Honourable
The Colonial Secretary,
Victoriaborg.

MEDICAL AND SANITARY REPORT ON THE GOLD COAST COLONY

FOR THE YEAR ENDING 31st DECEMBER, 1899.

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The General Report.

The year 1899 has been one of much activity and improvement in the Medical Department. In October, Accra was visited by Dr. Fielding Ould, a member of Dr. Ross's expedition from the Liverpool School of Tropical Medicine to the West Coast of Africa.

He stayed about one week, and endeavours were made to help him in every way he suggested, and to show him as far as possible the work which was being done in the Colony.

It was expected that the Malarial Commission sent by the Royal Society would visit Accra last year, but they did not do so, though it is hoped that they will be able to do so this year.

A need had been felt for some time back by Officials and others travelling in the interior without a doctor for some simple medical directions in case of disease.

In order to meet this need a small pamphlet, entitled "Simple Medical Directions for use when proceeding on a journey in the Gold Coast Colony without a Medical Officer," has been published. It is divided into four sections—

Section A.—Directions for the use of drugs.
Section B.—Directions in disease.
Section C.—Treatment of carriers.
Section D.—List of drugs;

and it is hoped that it will meet a need.

Arrangements have been made for the building in 1900 of a new Hospital at Axim, and of a new Contagious Diseases Hospital at Accra, and for the proper fitting of the hospital at Cape Coast.

Investigations into the Fevers and various other diseases of the Gold Coast have been carried out during the past year and further reference will be made to reports upon these subjects under the head of the Pathological Laboratory. Many new instruments have been bought during the past year, and endeavours are being made to supply all the stations of the Colony with instruments of the most modern type.

The beginning of 1900 brings to an end the three years' trial of European Nurses on the Gold Coast. They have been found to be a great success and it has been decided to increase the number to four, and to place one Nursing Sister at Cape Coast in the new hospital just opened there.

A new hospital dietary has been issued to meet the needs of the Hospitals which afford accommodation to Europeans and Native Officials. This new dietary is based upon those of European Hospitals, but modified to meet the requirements of the climate and the natives.

New rules for the guidance of the Matron and Nursing Sisters in the Colonial Hospital have also been issued.

2.—The Health Report.

The general health of the Colony during the past year was good; out of 166 European Officials there were only 9 deaths and 23 cases of invaliding, and out of an estimated number of 400 Non-Official Europeans there were

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18 deaths and 52 cases of invaliding. The rates of death and invaliding per thousand are shown below :—

Invaliding and death rate—Europeans.

Class.	Number.	Deaths.	Invalided.	Death rate per 1,000.	Invaliding rate per 1,000.
Official	166	9	23	54·2	138·5
Non-Official	400	18	52	45·0	130·0
Both	566	27	75	47·7	132·5

This death rate is slightly higher than the average death rate for Officials for the Colony, which is about 47·8 per thousand.

The table is faulty because the actual number of Non-Official Europeans in the Colony is unknown.

No death rate can be calculated for Native Officials or Natives, owing to lack of information ; but an attempt at an estimate can be given for Accra, assuming that there are 20,000 inhabitants, the burial rate was 731, gives 36·5 per thousand as the death rate, which is probably far below the real.

Attempts are being made so that in future more correct estimate of the natives' death rate may be given. With regard to the European Official death rate a few points may be noted.

1. The average age of European Officials is between 25—35 years, and the death rate in England of persons of both sexes of that age is only 9 per thousand.

2. The European Official, however, is examined by a medical man before being allowed to proceed to West Africa, therefore he is presumed to be a picked man, while the 9 per thousand of deaths in England are from all conditions.

From these it will be noticed that considering that the persons are picked the death rate of 54·2 per thousand bears far more than the mere figures show.

Every attempt has been made during the last few years to decrease the mortality and sickness rate by providing good food, good habitations, and by improving the sanitary conditions of the towns, &c., and by providing hospitals and good nursing and by giving medicines and directions for their use to persons travelling, and it is hoped that by these means the death rate may be diminished ; but there is one point which is little considered, and that is the danger to health brought about by travelling in the rains. This, without doubt, must be done, but it is hoped that during the worst months as little systematic travelling will be done as possible. In this respect I do not refer to short journeys or to changes of station, but to long journeys in the bush involving weeks in their execution, and compelling persons to wade repeatedly through marshes and to swim rivers, or to be exposed day after day and week after week to the rains while travelling.

The general health of Officers in the Northern Territories does not appear to have been good in the latter half of the year.

An increase in the number of cases of Hæmoglobinuric or Black Water Fever in the Colony is to be noticed, though the mortality therefrom was not high.

3.—Special Health Reports.

Special health reports will be considered from the following stations :—

Accra, Cape Coast, Axim, Kumasi, Kwitta, Adda, Elmina, Akuse, Saltpond, Wassaw, Winnebah.

1. *Accra.*—The general health has been fairly good, with two European Official deaths and four Non-Official; the death rate per thousand and the invaliding rate is shown below :—

Death rate.—Officials ...	...	21·27	per thousand.
Non-Officials	...	62·50	,,
Invaliding rate.—Officials ...	...	138·29	,,
Non-Officials	...	156·25	,,

The death rate is less than in 1898, which was 28·84, and 100·00 per thousand respectively for Officials and Non-Officials.

The Native health has been good.

The good health is probably due to the small rainfall and improvement in sanitation.

2. *Cape Coast.*—The general health of Europeans has been fairly good. There have been two Official European deaths, and two Non-Official European deaths. The health of Natives, Official and Non-Official, has also been good.

Common disease has been Remittent Fever.

3. *Axim.*—The health of the European population has been bad, Non-Officials being the greatest sufferers; the commonest diseases being Remittent and Intermittent, Black Water and Bilious Remittent Fevers, with Malarial Neuritis, Malarial Cachexia.

The health of the Natives was satisfactory, much better than in other years; Syphilis and Gonorrhœa being very common.

The sickness of the Europeans is probably due to the small amount of rain.

4. *Kumasi.*—European health good. Prevalent diseases Malarial Fevers. One Non-official death and two European Officers invalided. Health of Natives good. Good health is accounted for by the good sanitary condition.

5. *Kwitta.*—Health of the Europeans bad, excepting the first quarter, and the health of the Non-Officials was also bad, Malarial Fever being the common disease. The health of Natives good. The bad health of Europeans was most marked when most rain fell there. The rain-fall for the year was small.

6. *Adda.* — General health of the Europeans was not good at the commencement, but improved towards the end of the year. Black Water and the Malarial Fevers were the most common diseases. The health of the Natives was good.

7. *Elmina.*—Europeans' and Natives' health has been good. One death occurred among Non-Official Europeans, due to Remittent Fever.

8. *Akuse.*—During the first and third quarters the health of the Europeans was bad, but good otherwise. The prevalent diseases were Diarrhœa, Bilious Remittent and Black Water Fevers.

The bad health in first and third quarters was attributed to heavy rains, oppressive heat, insanitary condition. The health of the Natives was bad during the third quarter, but otherwise good. The prevalent disease being Malarial Fever.

9. *Saltpond.*—The European health was better than in the previous year. The death rate was 117·6 per thousand. The invaliding rate was 58·8 per thousand. While the preceding year the death rate was 266·6, and the invaliding 266·6 per thousand. The prevalent diseases were Black Water, Remittent and Bilious Remittent Fevers.

The Native health was good; the death rate among Native Officials being 22·2 per thousand. The prevalent diseases were Yaws, Ulcers, Syphilis.

10. *Wassaw District.*—European health was very good except in the second quarter. Malarial Fevers were the prevalent diseases. The Native health was good.

11. *Winnebah.*—European health was good. Bilious Remittent Fever was the commonest disease. The Native health was good.

Report upon Hospitals.

This Report will be considered under the headings of :—

(A.) General Hospitals.
(B.) Contagious diseases Hospitals.

(A.)—*General Hospitals.*—These exist at Accra, Cape Coast, Axim, Kwitta, Kumasi, Saltpond, Elmina.

The following are extracts from the reports of the different Medical Officers in charge of these hospitals. The Saltpond Hospital has been closed during the past year, but it is hoped it will be re-opened early next year, and that as soon as possible a new one will be built.

It is proposed to build a new Hospital at Axim next year.

Report on the Colonial Hospital, Accra.

1. *General Report.*

I beg to report that during the year 1899 the Colonial Hospital has been in charge respectively of Dr. De Groot and myself.

This year has seen considerable changes in the arrangements of the Hospital.

The Lunatics have been removed from the old Lunatic Asylum to Christiansborg Castle, and the old Asylum has been converted into an excellent General Medical Store for the Colony.

The old General Medical Store has become the Medical Store of the Colonial Hospital.

A prison ward and a native female ward have been constructed out of the old general hospital store where the hammocks, paints, &c., &c., were kept.

The old female ward and Hospital Medical Store, and the Native female official ward have been converted into the Chief Medical Officer's Offices.

The former Hausa Hospital, vacated by the removal of the Hausas to the Cantonments, has by the kindness of His Excellency the Governor been converted into a Central Pathological Laboratory for the Colony.

The old Asylum garden has been handed over to the Hospital, but unfortunately there is no labour available by means of which it can be cultivated.

The Bungalow erected to the East of the Hospital is now occupied by the Assistant Colonial Surgeons.

This is a great advantage, as they can quickly be called to an urgent or serious case, and can easily visit the hospital at night.

A quantity of new furniture, crockery, &c., have been provided to meet the demands of the wards.

The European and other wards have in this way been considerably improved.

These matters concerning linen, furniture and crockery have already been reported upon in the Matron's report at the end of the year.

The verandah of the European part of the Hospital and the lower part of the whole Hospital has been decorated with tubs containing flowers.

The Matron and Nursing Sisters now live in a Bungalow situate in the Hospital grounds.

2. *Report on the Patients.*

This will be considered under two heads :—

(A.) In-patients.
(B.) Out-patients.

(A.)—*In-patients.*—The number of In-patients treated during 1899 was 628 as against 959 in 1898, thus showing a decrease of 331 during the year.

The 628 In-patients were classified as follows :—

Europeans	50
Native Officials	81
Hausas	152
Civil Police...	65
Natives	280

In 1898 the 959 In-patients were classified :—

Europeans	42
Native Officials	60
Hausas	374
Civil Police...	88
Natives	395

Increase.—These figures show a slight increase in Europeans, viz. :—8 during the year, and a more marked increase of Native Officials, viz., 21.

The reason of these increases, in my opinion, is the better nursing, and better food, and better accommodation now provided.

Decrease.—The figures show a marked decrease in—

1. Hausas. 2. Civil Police. 3. Natives.

1. *Hausas.*—This decrease is due to the fact that the Hausas moved from Accra to the Cantonments, where they have their own small hospital.

The diminution in the Police is due to there being less in the Town.

The diminution in the Natives is due to the fact that only serious cases are admitted.

Total Decrease.—The total decrease of 331 is divided as follows :—

Hausas	222
Civil Police	23
Natives	115
Total	360
Less 29, increase in Native Officials and Europeans	331

(B.)—*The Out-patients.*—The European and Native Official Out-patients are not counted in the following numbers, which consist entirely of Natives and Police.

The numbers are :—

New cases.	Old cases.
5,495	10,434

I may state that I do not consider that 10,434 old cases are any like the true number, which I should consider to be much higher, probably more nearly 30,000, as the records of the visits of old patients are seldom kept.

In 1898 the numbers were :—

New cases.	Old cases.
7,885	10,534

In other wards there is a decrease of 2,390 in the new cases, and of 100 in the old cases.

In my opinion the diminution in the new cases must largely be due to the removal of the Hausas, whereas, I do not consider the number of old cases to be correct.

Operations.—In 1899, 26 operations were performed, as against 62 in 1898, being a diminution of 36.

Among these there were some operations upon cases of Henpuye or Goundon which did very well.

Mortality.—The total mortality was 36 deaths among 628 In-patients, *i.e.*, 5·7 per cent., as against 5·6 per cent. in 1898.

The mortality from operations was nil, as against 6·4 per cent. in 1898.

Diseases.—The most common diseases among In-patients were :—

Remittent Fever	60
Guinea Worm	56
Intermittent Fever	45

and among Out patients :—

Skin Diseases...	1,303
Bronchitis	484
Guinea Worm	172

3. *Report on the Expenditure in Diets and the Fees.*

The total expenditure in diets was £295. 10s. 4d., as against £457. 10s. 10d., a decrease of £162. 0s. 6d.

The average monthly expenditure was £24. 12s. 6½d., as against £38. 2s. 6¾d. in 1898.

The greatest expenditure was in the month of January, £39. 11s. 10½d., as against expenditure in October, 1898, of £52. 3s. 7½d.

The fees recovered from In-patients were £152. 4s. 6d. during 1899.

Operating Room and Instruments.—The operating room has been improved, and a number of new instruments which were badly needed have been added. —(*Dr. Chalmers.*)

Report on the Colonial Hospital, Cape Coast.

The Colonial Hospital at Cape Coast was in charge of Drs. Murray and De Groot.

There were 215 In-patients, of whom 16 died, giving a mortality of 7·4 per cent.

The Out-patients numbered :—

New cases	1,844
Old cases	4,852
Total	6,696

The cost in diets was £113. 18s. 10d., and the fees recovered from patients were £21. 8s. 6d.—(*Dr. De Groot.*)

Report on the Colonial Hospital, Axim.

The Colonial Hospital at Axim was under the charge of Dr. Langstaff.

The accommodation is much too small, but a new hospital is about to be built.

There were 63 In-patients treated, and of these 7 died.

The Out-patients numbered :—

New cases	...	...	...	970
Old cases	...	...	...	1,726

The prevalent diseases were Malarial Fevers, Gonorrhœa, Syphilis, Ulcers, Rheumatism, Chest affections, Diarrhœa, and Skin diseases.—(*Dr. Langstaff.*)

Report on the Colonial Hospital, Kwitta.

The In-patients numbered 115, of whom 7 were females; this is an increase of 20 over the number last year. There are 12 beds provided for males, but these have never been fully occupied. Among these patients there were four deaths—one from Dysentery, one from Remittent Fever, one from Intermittent Fever, one from Tetanus—giving a mortality of 3·4 per cent.

The most common complaints were :—Remittent Fever, Intermittent Fever, Guinea Worm, Skin diseases, Dysentery, and Syphilis.

The Hospital is in good condition, and the cubic space per head is 1,189 cubic feet.—(*Dr. Taylor.*)

Report on the Colonial Hospital, Elmina.

The building is in good repair and afforded adequate facilities for In and Out-patient treatment.

There were 102 In-patients treated during the year, of whom six died—one from Tumour, one from Diabetes, one from Cystitis, one from Bronchitis, one from Diarrhœa, and one from Pyæmia.

There were 14 operations, with one death from Pyæmia. The mortality among the In-patients was 5·8 per cent., and among the operation cases 7·1 per cent.

The Out-patients numbered :—

New cases	...	...	...	1,200
Old cases	...	...	...	4,053
	Total	...	...	5,253

Report on the Colonial Hospital, Kumasi.

The new Colonial Hospital was completed during the year, and was opened for the reception of patients in July. The Hospital consists of three large wards, the two larger being for the Hausas and other patients, and the smaller and middle one for Europeans.

The number of In-patients was 197, of which 177 were Hausas and 20 civilians.

The Out-patients were :—

New cases	...	...	...	1,088
Old cases	...	...	...	5,868
	Total	...	...	6,956

(*Dr. Tweedy.*)

4.—Report upon Dispensaries.

Dispensaries exist at :—(A.) Addah. (B.) Akuse. (C.) Saltpond and Anamaboe. (D.) Tarkwa. (E.) Winnebah.

The Out-patient departments of the various hospitals have already been considered under the heading of Report on the Hospitals.

Extracts from the Reports of the various Dispensaries are as follows :—

(*a.*)—*Report on the Dispensary at Addah.*

The Dispensary is situate in the centre of the Town and is unsuitable, as the consulting room is too small and has also to be used as a store. A new Dispensary or Hospital is urgently needed. No operation can be performed, as there is no suitable place, nor is there accommodation for the patients afterwards. The Dispensary is kept clean and in good order.—(*Dr. Thain.*)

(*b.*)—*Report on the Dispensary at Akuse.*

During the year 1899, the number of patients treated was :—

New cases	...	...	...	720
Old cases	...	...	...	1,778
Total	...	...		2,498

This was an increase in new cases of 42, and old cases 85 over the preceding year.

The prevalent diseases were :—Malarial Fevers, Rheumatism, Bronchitis, and Gonorrhœa.

There was a marked diminution in the cases of Guinea Worm, and this is attributed to the natives drinking the water of Volta River rather than that of the Lagoon.—(*Dr. Coker.*)

(*c.*)—*Report on the Dispensaries of Saltpond and Anamaboe.*

Saltpond.—During 1899 there were :—

New cases	...	...	...	752
Old cases	...	...	...	1,963
Total	...	...		2,715

This is a decrease of 242 new cases and 423 old cases as compared with the preceding year.

Three operations were performed, as compared with six of the preceding year.

The diminution in attendance of patients is attributed to the charges made under the Hospitals and Dispensary Fees Ordinance, which came into force during the year.

Anamaboe.—At Anamaboe there were :—

New cases	...	...	...	718
Old cases	...	...	...	1,229
Total	...	...		1,947

as compared with 921 new cases and 1,590 old cases, the diminution being probably due to the same causes as at Saltpond.—(*Dr. Quartey Papafio.*)

(*d.*)—*Report on the Dispensary at Tarkwa.*

A Dispensary was started in November, 1898, at Tarkwa, but it was not till February, 1899, that a proper building was opened. This is a bamboo house, on a raised floor of swish, thatched with leaves.

The majority of the patients during the year have been Government Officials, but the natives of the District are gradually beginning to know and appreciate the value of European medicines.

During the year the following attendances were recorded :—

New cases	...	...	...	233
Old cases	...	...	...	421
Total	...	...		654

The prevalent diseases were :—Constipation, Rheumatism, and Bronchitis. —(*Mr. J. R. Sutton.*)

(*e.*)—*Report on the Dispensary at Winnebah.*

The number of patients attended at this Dispensary was :—

New cases	...	...	...	1,128
Old cases	...	...	...	4,007
Total	...	...		5,135

This is an increase of 23 new cases, and 758 old cases over the attendances of the preceding year.—(*Mr. H. D. Laryea.*)

5.—Report upon the Lunatic Asylum.

There is one Central Lunatic Asylum in the Colony, and this is now situate in the Castle at Christiansborg, near Accra, which has been excellently fitted for the reception of the patients.

Previous to the removal to Christiansborg Castle the Asylum occupied a building in the compound of the Colonial Hospital at Accra. The change from this place to the Castle took place on June 24th, 1899.

During the year the Asylum was in charge of Drs. Buée, Montgomery, and Knight. A hospital exists in the Asylum and contains three beds for males, and three for females.

During the year there were 28 lunatics on the sick list, and of these 11 died from Phthisis, Asthenia, Beri-beri, Dysentery, Diarrhœa, Cerebral Hæmorrhage, Syphilis, Abdominal Tumour, Epilepsy, Kidney diseases. No records of Post Mortems have been kept, but it is hoped that in future this will be done. During 1899 there were 67 lunatics treated in the Asylum, there being 24 admissions and 5 discharges.

These 67 lunatics suffered from the following kinds of mental disorder :—

	Male.	Female.
Subacute Mania	1	—
Mania	24	9
Melancholia	7	2
Delusional Insanity	1	2
Epilepsy	3	—
Dementia...	8	4
Idiocy	3	1

Two were found on observation to be sane.

The change from the old to the new position has in every way been found satisfactory, there being ample space for airing and exercising the patients ; and the large garden, which adjoins, affords wholesome and beneficial occupation to the more rational inmates. There are four good-sized dormitories, a large day room, two capital isolation rooms, and three smaller rooms capable of being converted into efficient strong rooms. There are two store-rooms on the ground floor.

Enclosed by these there is a fine court yard, which, having some large trees, makes a most excellent airing and recreation ground. On the first floor are the Kitchen, Dispensary, Office, Hospital, and Officials' quarters.

The Hospital is isolated from the remainder of the Asylum.

The health of the patients has been fairly satisfactory.

The old custom of treating violent patients by mechanical restraint is gradually passing away, and on the completion of the strong rooms will be found quite unnecessary.

The food supplied to the asylum has generally been of good quality.

The water supply is ample and excellent, being obtained from two large covered tanks.—(*Dr. Knight.*)

6.—Report upon the Medical Work in the Prisons.

Reports have been received from the following prisons:—1. Acra; 2. Addah; 3. Akuse; 4. Axim; 5. Cape Coast; 6. Elmina; 7. Kwitta; 8. Kumasi; 9. Saltpond; 10. Tarkwa; 11. Winnebah.

The general health of the prisoners appears to have been good, except at Axim and Winnebah, there being only 8 deaths in all the hospitals. The general sanitary condition of the various prisons also appears good, except the ventilation of Accra, which is said to be "very bad." The water and food is generally good. Prisoners have been employed in some useful way in all the prisons. Reduced diet and shot drill appear to have been the most common forms of punishment.

Accra	2
Akuse	1
Elmina	2
Kwitta	1
Kumasi	1
Tarkwa	1
Total	8

1. *Accra.*—General health good, and food good, but the water is only moderately good, and the ventilation of cells and wards very bad.—(*Dr. Rutherfod.*)

2. *Addah.*—General health fairly satisfactory, the most prevalent diseases being rheumatism, intestinal and urethral affections. Water was good, and food after a few complaints and warnings was remedied. Ventilation good, with the exception of the latrine.—(*Dr. Taylor.*)

3. *Akuse.*—There were 107 attendances at the Prison Hospital, and in the third quarter one death. The general health during the first and second quarters was good, but bad during the third and fourth.

The diet and water were good.

Ventilation was insufficient during the first and second quarters, but was improved during the third quarter and was made sufficient.—(*Dr. Coker.*)

4. *Axim.*—The general health of the prisoners was bad, but in most cases they came in with ulcers, guinea worm, pneumonia, bronchitis, gonorrhœa, skin and eye diseases. There was, however, no death.

Diet and water were good, and the ventilation fair.—(*Dr. Langstaff.*)

5. *Cape Coast.*—The general health of the inmates was very good, and the diet, water and ventilation good.—(*Dr. De Groot.*)

6. *Elmina.*—Health was good, except in the latter half of June. There were two deaths from remittent fever and diabetes. The food and water and ventilation were good.—(*Dr. Waldron.*)

7. *Kwitta.*—The general health has been good, except the debtors and untried in the first quarter. One death in the Colonial Hospital from remittent fever.

Food is good, but the water slightly brackish.

Ventilation in the untried prisoners' cell is extremely bad, but the other cells are fairly well ventilated.—(*Dr. Taylor.*)

8. *Kumasi.*—The general health, food, water and ventilation good.—(*Dr. Tweedy.*)

9. *Saltpond.*—General health and food and water good. Ventilation fairly good.—(*Dr. Quartey Papafio.*)

10. *Tarkwa.*—General health very good, water, food and ventilation good. There were 9 inmates of the hospital, of whom one died.

The out-patients numbered 67 new cases and 61 old cases.—(*Mr. J. R. Sutton.*)

11. *Winnebah.*—General health not good. Food and water excellent. Ventilation good.—(*Mr. H. D. Laryea.*)

7.—Report on the Pathological Laboratory.

During the greater part of the year pathological work has been carried out in a small room in the Colonial Hospital at Accra; but towards the end of the year the Hausa Hospital, left vacant by the removal of the Hausas from Accra to the cantonments, was, by the kindness of His Excellency the Governor, converted into a central pathological laboratory.

This laboratory is intended to be used for—

1. Original research into the causation and nature of the fevers and diseases found in the Gold Coast Colony.
2. The investigation of preparations or specimens sent from an out-station, reports being prepared upon these specimens and sent to the Medical Officer.

In other words, it is to be used as a research laboratory, and as a clinical investigation laboratory, from which Medical Officers may obtain scientific reports upon any material they choose to forward.

In this way it is hoped the laboratory may meet a need. The Assistant Colonial Surgeon at an out-station has neither time nor facilities for microscopical or bacteriological work, but by means of this laboratory this work will be done and the result, with probably specimens, forward to the Medical Officer at the station.

In this way scientific knowledge of the different diseases at the various out-stations will be obtained.

In order to facilitate this a small pamphlet has been printed under the title "An Investigation into the Fevers of the Gold Coast Colony," in which are contained directions with regard to clinical records of fevers and to the microscopical examination of cases of fever.

8.—Meteorological Report.

Returns of the meteorological observations have been made from many stations. These consist of solar maximum and minimum, shade maxim and minimum, rainfall and the direction of the wind, and are to be found in the Appendix. Barometers for the different stations are needed, and it is hoped will be soon supplied.

In Accra an anemometer exists, and readings of the velocity of the wind have been taken.

9.—Small-Pox and Vaccination.

Small-pox has not been so prevalent during this year. It was principally noted in Akuse, Addah, Saltpond.

There was an epidemic in—

Akuse, 36 cases, with 9 deaths.
Addah District, in a village called Elavanyoh.

There was an outbreak in February—

Saltpond, 13 cases—moderately.
Anamaboe, 32 ,, ,,
Kwitta, 1.

Vaccination.—A supply of lymph has been periodically got from England. Vaccination has been carried out with good effect at some stations, particularly in the Addah and Akuse Districts; in the latter there were 421 successful vaccinations and 98 unsuccessful, but these latter consist largely of persons who did not report themselves again after the operation.

10.—Sanitary Report.

During the past year every attempt has been made to improve the sanitation of the Colony.

In Accra the sanitation is now carried on by the Town Council, by means of their own Medical Officer of Health, and is not now in the hands of the Government.

Cape Coast.—The sanitary condition of Cape Coast is said to be fairly good, taking the filthy habits of the natives into consideration.

The number of latrines and scavengers have been increased. The drainage of the streets has been improved, and public wells have been cleaned and repaired; it is, however, recommended that the number of scavengers should be further increased, and the drainage of the town still further improved.—(*Dr. De Groot.*)

Axim.—The general condition is not satisfactory. The streets are clean, but the outskirts of the town are bad, due to the deposition of rubbish and decaying vegetable matter. In parts the houses are too crowded together. The number of latrines and scavengers have been increased; and it is hoped that a system of drainage will soon be adopted.—(*Dr. Langstaff.*)

Elmina.—Elmina has been very clean within the town limits, but the outskirts are dirty. The water supplies for the natives appear to be good. More latrines are needed.—(*Dr. Waldron.*)

Saltpond and Anamaboe.—Saltpond has lately increased in size, and though kept fairly clean yet there is a need for new latrines and more drains.

A new cemetery was opened.

The existing latrines were kept in good order.

Anamaboe also needs increase in latrines and scavengers.

Meteorological instruments needed.—(*Dr. Quartey Papafio.*)

Akuse.—The latrines, streets and drains have been well attended to throughout the year, and the condition of certain parts of the town improved.

More roads and drains, a new market-shed and slaughter-house, latrines with drums, and meteorological instruments are needed.—(*Dr. Coker.*)

Addah.—Town in fair sanitary condition.—(*Dr. Thain.*)

Kwitta.—The town is kept very clean, but the roads are badly in need of repair.

The hollows in the roads have been filled in with swish.

Latrines and water storage have been improved.—(*Dr. Taylor.*)

Wassaw.—Town kept clean; streets have been repaired and rubbish heaps burned and buried.

Latrines and dust-bins desired.—(*Mr. Vroom.*)

Kumasi.—The Station is in a very fair sanitary condition as far as the European quarters are concerned; but, owing to the latrines in the Hausa lines, the water supply is in a constant danger of contamination.—(*Dr. Tweedy.*)

Winnebah.—The town of Winnebah has been tidy throughout the year.—(*Mr. Wulff.*)

Meteorological Return for the Year 1899, Aburi.

	Temperature.						Rainfall.		Winds.		Remarks.
	Solar Maximum.	Minimum on Grass.	Shade Maximum.	Shade Minimum.	Range.	Mean.	Amount in Inches.	Degree of Humidity.	General Direction.	Average Force.	
January	122·54	66·48	85·77	69·03	16·77	77·40	·50		N. E.		
February	132·89	69·25	85·57	69·67	15·82	77·62	4·74		N. W.		
March	141·61	70·61	87·35	70·19	17·16	78·77	6·18		W. N. W.		
April	143·56	70·90	87·03	70·73	16·33	78·88	3·08		N. E. N. W.		
May	145·45	70·16	85·93	70·22	15·17	78·07	3·98		S. W. N. W.		
June	137·96	68·28	81·90	63·73	18·30	72·81	5·94		W.		
July	136·61	69.48	80·61	68·87	11·74	74·74	5.35		N. W.		
August...	138·67	69·90	78·96	68·09	10·74	73·52	5·45		W. N. W.		
September	143·60	70·50	82·90	68·60	14·30	75·70	1·15		N. W. W.		
October	142·51	69.03	84·64	68·41	16·16	76·52	6·16		W.		
November	143·06	71·23	88·13	69·93	16·06	78·03	5·54		N. N. W.		
December	136·77	71·29	85·06	70·22	14·96	77·64	1·05		N. W.		
Mean	138·72	69·62	84·25	68·92	15·24	76·52	4·09				

Meteorological Return for the Year 1899, Kumasi.

	Temperature.						Rainfall.		Winds.		Remarks.
	Solar Maximum.	Minimum on Grass.	Shade Maximum.	Shade Minimum.	Range.	Mean.	Amount in Inches.	Degree of Humidity.	General Direction.	Average Force.	
January	132·1	66·3	84·5	62·5	26·1	73·5	—	—	—	—	
February	137·4	72·7	89·7	69·3	20·3	79·5	6·28	—	—	—	
March	144·9	72·5	91·2	70·5	20·5	80·8	4·08	—	—	—	
April	146·6	71·3	91·8	70·1	21·7	80·8	6·46	—	—	—	
May	142·2	71·09	89·77	70·61	19·1	80·24	10·33	—	—	—	
June	139·7	70·4	86·3	69·8	16·5	78·0	7·03	—	—	—	
July	167·9	76·1	81·2	70·6	15·3	75·9	16·12	—	—	—	
August	143·3	71·1	83·4	70·7	12·7	80·2	10·59	—	—	—	
September	138·6	68·8	85·5	70·4	15·1	77·9	15·43	—	—	—	
October	141·03	73·19	86·4	70·5	16·0	78·4	6·44	—	—	—	
November	138·3	66·1	88·7	71·0	17·4	79·8	1·94	—	—	—	
December	132·5	68·1	87·8	70·9	16·8	79·3	2·63	—	—	—	
Mean	141·2	70·21	86·77	69·34	18·9	78·05	7·93	—	—	—	

Meteorological Return for the Year 1899, Gambaga.

	Temperature.						Rainfall.		Winds.		Remarks.
	Solar Maximum.	Minimum on Grass.	Shade Maximum.	Shade Minimum.	Range.	Mean.	Amount in Inches.	Degree of Humidity.	General Direction.	Average Force.	
January	—	—	82·8	73·9	—	78·3	—	—	N.E.	—	
February	—	—	88·0	79·8	—	83·9	0·66	—	N.E.	—	
March	—	—	—	70·1	17·9	150·1	0·23	—	S.E.	—	
April	—	—	—	78·5	16·8	132·0	3·59	—	S.E.	—	
May	—	—	92·8	77·9	14·2	85·3	2·94	—	S.W.	—	
June	—	—	86·3	74·5	12·5	80·4	3·84	—	S.W.	—	
July	—	—	85·3	71·1	8·9	78·2	12·03	—	S.W.	—	
August...	—	—	82·9	71·9	0·9	77·4	11·49	—	S.W.	—	
September	—	—	84·0	72·2	12·5	78·1	7·67	—	S.W.	—	
October...	—	—	86·9	70·7	16·2	78·8	2·90	—	S.W.	—	
November	—	—	91·9	73·4	18·4	82·6	—	—	S.W.	—	
December	—	—	92·8	74·4	18·4	83·6	—	—	N.E.	—	
Mean	—	—	107·6	73·3	13·8	90·4	5·03	—	—	—	

Return of the Statistics of Population for the Year 1899.

	Europeans and Whites.	Africans.	East Indians.	Chinese and Malays.	Mixed and Coloured.	
Number of Inhabitants in 1898						
„ Births during the year 1899 ...						
„ Deaths „ „ 1899 ...						
„ Immigrants „ „ 1899 ...		*No Returns available.*				
„ Emigrants „ „ 1899 ...						
Number of Inhabitants in 1899						
Increase or						
Decrease						

Meteorological Return for the Year 1899, Accra.

	Temperature.						Rainfall.		Winds.		Remarks.
	Solar Maximum.	Minimum on Grass.	Shade Maximum.	Shade Minimum.	Range.	Mean.	Amount in Inches.	Degree of Humidity.	General Direction.	Average Force.	
January ...	126·6	65·2	86·8	70·7	16·0	78·7	—	—	Nil.	4·30	
February ...	132·9	68·3	86·6	71·1	15·8	78·8	0·62	—		432·5	
March ...	135·0	70·5	88·7	71·7	16·9	80·2	1·99	—		381·3	
April ...	142·7	71·4	88·8	71·6	17·1	80·2	0·64	—		315·4	
May ...	137·3	70·5	87·5	70·8	16·7	79·1	4·16	—		266·8	
June ...	134·0	69·4	84·5	68·3	16·1	76·4	4·03	—		274·2	
July ...	134·5	68·8	83·5	69·4	14·0	76·4	0·11	—		291·0	
August ...	130·4	65·7	81·6	68·2	13·3	74·9	4·12	—		413·5	
September ...	137·1	68·3	79·7	68·7	17·7	74·2	0·56	—		378·8	
October ...	135·0	68·8	84·3	68·1	16·2	76·2	2·47	—		280·8	
November ...	134·4	69·2	88·6	72·9	15·7	80·7	—	—		271·3	
December ...	128·1	68·1	87·4	73·3	14·1	80·3	0·94	—		299·1	
Mean ...	134·0	68·6	85·6	70·4	15·8	78·0	1·96	—		336·2	

Monthly Return of Diseases and Deaths in 1899, at the following Institutions:—The Hospitals at Accra, Axim, Cape Coast, Elmina and Kwitta.

MONTHS.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Yearly Total.		Remarks.
Mean Temperature	78·7		78·8		80·2		80·2		79·1		76·4		76·4		74·9		74·2		76·2		80·7		80·3		936·1		
Mean Humidity	79·7		76·3		77·08		75·2		72·45		76·54		79·8		83·28		82·2		83·4		76·41		80·3		942·66		
DISEASES.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
GENERAL DISEASES.																											
Small-pox	34	1	14	...	4	1	14	...	8	1	6	2	18	1	16	...	29	1	16	...	18	...	12	...	189	7	
Chicken-pox	1	...	...	...	1	...	...	...	1	...	...	...	5	...	1	...	...	...	2	...	2	...	4	...	17	...	
Typhus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Dengue	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Influenza	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Febricula	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2	...	
Enteric Fever	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Dysentery	4	1	2	2	1	...	6	...	2	...	1	1	6	1	...	...	3	...	4	2	...	...	...	...	29	7	
Yellow Fever	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	
Malarial Fever :—																											
(*a*) Intermittent... ...	7	...	9	...	5	...	13	...	6	1	9	...	6	...	9	...	4	...	4	...	1	...	6	...	79	1	
(*b*) Remittent	7	2	4	...	3	1	5	...	11	2	6	1	16	1	10	1	5	1	5	...	2	...	8	1	82	10	
(*c*) Pernicious R. ...	1	...	1	...	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	2	
Erysipelas	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	
Pyæmia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Septicæmia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Tetanus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	..	...	...	
Tubercle	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Leprosy—																															
(*a*) Tubercular	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(*b*) Anæsthetic	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yaws	1	...	...	...	...	...	...	1	...	1	...	...	...	...	...	1	...	1	...	1	...	...	...	...	...	...	6	...			
Syphilis—																															
(*a*) Primary	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	3	...			
(*b*) Secondary	1	...	...	...	...	...	...	4	...	...	...	1	...	2	...	1	...	...	...	2	...	1	...	2	...	...	14	...			
(*c*) Inherited	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Gonorrhœa	1	...	...	...	...	...	...	7	...	2	...	1	...	...	...	...	...	...	...	1	...	2	...	1	...	...	15	...			
Hydrophobia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Scurvy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Alcoholism	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	1	...	2	1					
Delirium Tremens	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Rheumatism	6	...	5	...	8	...	4	...	4	1	2	...	3	...	1	...	5	...	4	...	1	...	1	...	44	1					
Rheumatic Fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Gout	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
New Growth, non-malignant ...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	1	...	...	...	...	...	2	...					
New Growth, malignant ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Anæmia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	2	...					
Diabetes mellitus	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	1	1					
Diabetes insipidus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Debility	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...					
LOCAL DISEASES.																															
Diseases of the Nervous System.																															
Sub-section 1.																															
Diseases of the Nerves—																															
Neuritis	...	...	...	...	1	...	...	...	1	1	...	...	1	...	1	...	...	...	1	1	...	...	...	...	5	2					
Meningitis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Myelitis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Hydrocephalus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
Carried forward ...																															

MONTHS.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Yearly Total.		Remarks.
Mean Temperature	78·7		78·8		80·2		80·2		79·1		76·4		76·4		74·9		74·2		76·2		80·7		80·3		936·1		
Mean Humidity	79·7		76·3		77·08		75·2		72.45		76·54		79·8		83·28		82·2		83·4		76·41		80·3		942·66		
DISEASES.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
Brought forward ...																											
Encephalitis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Abscess of Brain	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Congestion of Brain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Sub-section 2.																											
Functional Nervous Disorders—																											
Apoplexy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Paralysis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Chorea	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Epilepsy	1	...	...	...	...	...	...	...	...	...	2	2	1	...	...	...	1	...	...	...	...	...	...	...	5	2	
Neuralgia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Hysteria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	
Sub-section 3.																											
Mental Diseases—																											
Idiocy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Mania	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Melancholia...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Dementia	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	
Delusional Insanity ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	...	...	...	...	...	4	...	

Local Diseases—																															
Diseases of the Eye	...	4	...	1	...	2	...	1	...	...	...	...	...	...	...	...	...	2	...	...	...	2	...	1	...	13	...
,, ,, Ear	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...
,, ,, Nose	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	2	...
,, ,, Circulatory System	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	1	...	...	...	...	...	...	1	...	4	...
,, ,, Respiratory System		14	2	7	...	11	4	7	...	6	...	4	1	8	2	3	...	2	1	4	1	4	2	4	...	74	13
,, ,, Digestive System		8	...	25	2	9	...	14	...	6	...	7	2	5	...	7	...	7	1	5	...	7	1	8	1	108	7
,, ,, Lymphatic System		...	...	...	...	...	...	...	...	2	...	2	...	1	...	2	...	...	...	...	...	...	...	2	...	9	...
,, ,, Urinary System		1	1	1	...	...	...	2	...	...	...	...	...	...	...	2	...	...	...	1	...	...	...	1	...	8	1
,, ,, Generative System—																											
Male Organs		8	...	3	...	4	...	4	...	4	...	2	...	4	...	3	...	1	...	1	...	...	...	4	...	38	...
Female ,, ...		...	...	...	...	...	...	...	...	...	...	2	1	3	...	2	...	...	...	...	...	...	...	...	...	7	1
Diseases of the Organs of Locomotion		8	...	4	...	2	...	1	...	6	...	1	...	...	...	2	...	5	...	2	...	7	...	2	...	40	...
,, ,, Cellular Tissue		5	...	4	...	...	...	1	...	3	...	...	...	1	...	1	...	1	...	4	...	...	...	2	...	21	...
,, ,, Skin ...		1	...	5	...	3	...	7	...	1	...	2	...	3	...	6	...	1	...	...	...	1	...	2	...	32	...
Injuries, General		4	...	2	1	5	...	9	...	3	...	3	...	5	...	3	...	7	1	10	...	5	...	5	...	61	2
,, Local		16	...	6	3	5	...	14	1	7	...	3	...	4	...	1	...	6	...	3	...	6	...	5	...	76	4
Surgical Operations ...		...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	3	...
Malformations		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poisons		1	...	1	1	1	...	3	...	...	...	4	...	...	...	...	...	...	...	1	...	1	...	2	...	14	1
Parasites		14	...	6	...	6	...	19	...	8	...	2	...	5	...	3	...	4	...	6	...	6	...	7	...	86	...
Total		150	7	102	9	72	6	137	2	87	7	62	6	99	6	79	2	91	5	79	4	69	3	81	2	1,107	63

A FURTHER REPORT OF EXPERIMENTS UPON THE FRA FRA ARROW POISON;

BY

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September 1*st*, 1899.

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I.—Preliminary.

Some of these experiments were made this year at Gambaga, in the Northern Territories, while the remainder were conducted at the Colonial Hospital, Accra, both in the Gold Coast Colony, West Africa.

I have to express my gratitude to His Excellency Sir F. M. Hodgson, K.C.M.G., Governor of the Gold Coast Colony for his kindness in allowing me to read all papers, letters, &c., in his possession on the subject of the arrow poisons, to Dr. Henderson, the Chief Medical Officer of this Colony for his kind encouragement of my work and his valuable suggestions during its progress, to Captain Donald Stewart, C.M.G., for his kindness in giving me leaves, pods, seeds, &c., also to Mr. Cato, the Head Dispenser, for helping me with the experimental work.

I have been hampered by the smallness of the quantity of the poison at my disposal, but bring these experiments forward to assist people working in this field of research.

The experiments throughout have been conducted with the view of answering these questions:—

1. How does a man or animal die when hit by one of these poisoned arrows?
2. What treatment should be adopted in order to preserve life?

II.—The Material.

The arrows by means of which these experiments were conducted were brought into Gambaga in Mamprusia from the Fra Fra country by Mr. Fenton while I was Medical Officer at Gambaga.

The arrows were distinguished from the others by a little wooden spike, a red tuft, and were kept in separate quivers. The poison was evidently fresh and very virulent. When Captain Donald Stewart returned from his successful Fra Fra Expedition he very kindly brought me some leaves and a pod purporting to be from the tree from which the poison was obtained by the natives.

III.—Animals used for the Experiments.

The Animals used for the experiments were:—

Guinea Pigs; Sheep; Monkey; Frogs.

The account of the experiments upon sheep was included in my first report.

IV.—Experiments upon the Action of the Poison.

1. *Guinea Pigs.*—A large guinea pig was selected and into its back the tip of an arrow was inserted for one minute exactly. For five minutes nothing remarkable was observed, but at the end of this time movements of the jaws as though the animal was chewing something were observed. Directly after this weakness of the posterior extremities was noted. Then jerky movements of the head as though the animal felt some uneasiness there. Then retching and movements of vomiting with, after a little time, the bringing up of a little clear liquid. Finally the animal fell over on its side, kicked a few times, and died in eleven minutes from the commencement of the experiment, the heart ceasing to act before the respirations stopped. On making a *post mortem*, the organs were found to be healthy and there was no local irritation where the arrow was inserted. The brain, and particularly the medulla and the spinal cord appeared congested (microscopic sections of the brain and spinal cord being made.)

The heart was full of liquid blood and contracted readily upon stimulation.

2. A large healthy guinea pig was taken and an older arrow than the preceding was inserted into a small incision on the back for one minute.

Four minutes later evident movements of the muscles of the jaw, with much muscular restlessness were noted, and lasted ten minutes. Then retching and vomiting with jerky movements of the head, weakness of the posterior extremities, ending finally in death from cardiac failure in twenty minutes. *Post mortem* was the same as the preceding, but the spinal cord was very much congested.

3. *Sheep.*—A small incision was made through the skin of the back of a sheep and the head of an arrow inserted and allowed to remain for five minutes, and then removed.

The sheep was prevented from running about by having a cord attached to one hind leg. It remained quite well for twenty minutes, when it suddenly fell forward upon its fore legs. The heart ceased to beat, but the respirations continued a little longer, and it died.

Post mortem showed the heart in a state of diastole, the right side being much distended with blood, and the left empty. On stroking the heart carefully the musculature contracted.

4. *Monkey.*—An incision being made through the skin of the back of a small monkey, the arrow was inserted for thirty seconds and then removed. The animal remained quite well, lively and apparently free from all pain, playing about and climbing up a stick, &c., &c., for ten minutes. Then suddenly it

became jerky in the head, vomited, lost all power in its limbs and gently slipped off the rest upon which it was placed, lay down on the ground, and died in three minutes, from cardiac failure, from the time the symptoms first appeared. The *post mortem* showed the organs healthy, the heart contracted, but reacting to stimulus the brain and cord not nearly so congested as in guinea pigs.

5. *Frogs.*—An arrow was inserted into the subcutaneous lymph sac of a large frog for five minutes. No symptoms noted. Frog alive and well twenty-four hours later.

6. *Frog.*—An arrow inserted into the abdominal cavity making a severe wound.

Increased muscular irritability noted but no symptoms of the poison.

The animal died in one and-a-half hours.

7. *Frog.*—A small frog was taken and an arrow inserted into its subcutaneous lymph space for half-a-minute. No symptoms. Frog quite well twenty-four hours later.

Remarks.—The symptoms of paresis of the posterior extremities may, in my opinion, be referred to the congestion of the spinal cord.

The vomiting, the jerky movements of respirations and the cardiac failure (with a possible vasomotor disturbance) are referred by me to the action of the poison on the medulla. The death from cardiac failure appears to be due to the poison's action upon the cardiac centre in the medulla, and not to any local action upon the musculature of the heart, as this is still able to contract upon stimulation.

The latent period before the poison begins to act depends, as will be shown later, upon the rapidity of the heart's action, and therefore varies as to whether the animal is allowed to run about free or is kept quiet.

Cause of Death.—Cardiac failure, due to action of the poison on the centre in the Medulla Oblongata.

V.—Experiments upon the action of the Poison in Solution.

8. A large healthy guinea pig was hypodermically injected with a solution of half-a-grain of the poison scraped from an arrow head and dissolved in 55 minims of water, which was decanted.

The animal showed the usual symptoms of the poison in about six minutes, and died with the typical signs in ten minutes. The *post mortem* was exactly the same as in the previous cases.

9. A healthy guinea pig was hypodermically injected with a solution of half a grain of the powdered poison from an arrow head treated with fifty minims of Spiritus Vini Rectificati. Not much appeared to dissolve.

The animal died slowly, in seventy-five minutes, being comatose for some time before death. The symptoms did not appear to be those of the arrow poison.

Remarks.—The poison appears to be readily soluble in cold water.

VI.—Experiments upon the action of Drugs on the Poison.

10. *Amyl Nitrite.*—A large healthy guinea pig was selected and into it an arrow was placed for one minute in an incision beneath the skin, and Ayml Nitrite administered at once by inhalation. Symptoms of the poisoning

came on rapidly and the animal died in five minutes. *Post mortem* exactly as before.

11. *Hyoscin Hydrobromate*—A hypodermic injection of 1/50th of a grain of Hydrobromate of Hyoscin was administered into a guinea pig and then the arrow inserted under the skin for one minute.

Symptoms of the poison came on rapidly and the animal died in seven minutes. *Post mortem* exactly as in others.

12. *Strychnine Hydrochlorate.*—An arrow was inserted under the skin of a sheep for one minute, the wound was immediately and thoroughly disinfected with carbolic acid and thirty minims of the B.P. Liquor Strychnine at the same time injected.

The sheep was allowed to run freely. Nothing was noticed for ten minutes, when suddenly the animal stopped, fell forwards, gave a couple of kicks and died.

The heart and respirations apparently ceasing together.

13.—*Guinea Pig.—Strychnine only.*—Into a guinea pig weighing 290 grammes there was injected ·002 grammes of strychnine. Strychnine poisoning began in four minutes, and the animal died in one hour and ten minutes.

14. A guinea pig weighing 103 grammes was injected with ·0017 grammes of strychnine, and died in one hour from strychnine poisoning.

15. *Strychnine and the Arrow.*—A guinea pig weighing 342 grammes received ·0017 grammes of strychnine. Symptoms of twitching, trembling, running about, rubbing the nose, trying to hide, jerky muscular movements, increased muscular irritability for an hour.

At the end of this time an arrow was inserted in the usual way for thirty seconds. Slightly symptoms of poisoning in thirty-five minutes. One hour later, marked symptoms of the poison. Half-an-hour later, death. It died slowly and gently, and there was no paresis of the posterior extremities. Death ensued two-and-a-half hours from the commencement of the experiment and one-and-a-half from the insertion of the arrow.

Remarks.—Any drug like Amyl Nitrite, Hyoscin or Strychnine which increases the heart's action increases the rapidity with which the poison acts, and causes death to come on sooner. This appears to me to be simply due to the fact that the more rapid the circulation the quicker the poison is absorbed and the sooner it acts. The experiments with strychnine were performed with a view of testing the poison in the same way as Dr. Sims Woodhead tested the Acokantherin Poison of Uganda. He found that ·0025 grammes of strychnine was a lethal dose in a guinea pig weighing 600 grammes. I gave ·002 to a 290 gramme guinea pig and ·0017 to a 103 gramme guinea pig with fatal results. He found that four-fifths of the lethal dose of strychnine protected against a full lethal dose of the poison. I found that ·0017 grammes of strychnine in a guinea pig prolonged the life of a guinea pig weighing 342 grammes wounded by a poisoned arrow for thirty seconds. In this animal there is no doubt in my mind that the strychnine did neutralise largely the effect of the arrow poison, and if the dose given to the pig had been larger it might possibly have lived, but the dose of strychnine is apparently so near a lethal dose that no possible practical result could come out of further experiments, therefore I did not continue them.

Again, in order that strychnine may in any way act as an antidote it must be administered before the wound occurs, and if administered after the wound, causes death to come on more quickly.

Thus it appears to me that it is quite out of the question as a practical antidote.

VII.—Experiments upon the action of Permanganate of Potassium and the Poison.

16. *Potassium Permanganate alone.*—A large guinea pig was injected under the skin with 110 minims of water containing six grains of Potassium Permanganate. No general symptoms except those of extreme local pain where the injection was made. The guinea pig died at the end of twenty-four hours.

Post mortem showed the action of the permanganate to be quite local, there being a large black eschar there.

17. An arrow was inserted for thirty seconds on the right side of a guinea pig, and a solution of 6 grains of potassium permanganate injected on the left side. Arrow poison symptoms began in ten minutes and death ensued in three more minutes. Potassium permanganate action quite local and very painful.

18. Arrow was inserted for half-a-minute and then the nozzle of a syringe containing a 6 per cent. solution of potassium permanganate inserted until wound was distended (about 55 minims). Animal seemed in great pain from the injection of the permanganate of potassium. Slight symptoms of arrow poisoning came on, such as movements of jaws, muscles, &c., and passed off in fifteen minutes. Animal quite well at the end of forty-eight hours.

19. Control experiment was performed with the same arrow and without potassium permanganate, and the animal died in twenty-three minutes.

20. Arrow inserted for one minute and then wound filled with a 3 per cent. solution of permanganate.

Slight symptoms of poison, which passed off. Animal quite well two days later.

21. Control experiment with same arrow without potassium permanganate, animal died in twenty minutes with usual symptoms.

22. Arrow inserted for five minutes and then wound filled with 1 per cent. solution of permanganate. Symptoms of poisoning came on rapidly, and death ensued in twelve minutes.

23. Arrow inserted for five minutes and then wound filled with permanganate solution 6 per cent. Symptoms began rapidly, death ensued at the tenth minute.

24. Arrow inserted for three minutes and wound filled with 6 per cent. solution of permanganate. Death ensued in twelve minutes with usual poison symptoms.

25. Arrow inserted for two minutes and wound treated as before. Death ensued in twenty minutes.

26. Arrow inserted for thirty seconds and then the wound well injected with a 3 per cent. solution of permanganate. Animal did not have any symptoms of the poison and lived.

Remarks.—Permanganate of Potassium seems to act quite locally, and if injected at once into a guinea pig which has had the arrow inserted for only a short time it proves antidotal, but not if the arrow remains two minutes or longer. This antidotal action is purely local and appears to be due to the action of the permanganate upon the poison itself. I know of experiments done by the late Dr. Elliot, at Kintampo, when the arrows lost their virulence after being dipped in a solution of permanganate of potassium. These experiments show that it is the action of the permanganate upon the poison itself which renders it an antidote.

VIII.—Probable Source and Nature of the Poison.

The source and nature of the poison is still, in my opinion, most obscure.

One of the first points to be remembered is that there are several poisons known to these people.

The second is that we were fighting them, and this arrow poison which I obtained was specially prepared in event of an expedition coming against them. The tale told in Gambaga about this specially virulent poison, *i.e.*, that painted on the red tipped arrows, was that the Chief Fetish Priest, the King and one of the principal Chiefs go into the bush and there prepare the poison. The common people are not supposed to know anything about it.

Also it is highly improbable that natives against whom we were fighting could give any information with regard to such a secret and virulent poison.

They also have an antidote which I have never seen.

With regard to actual specimens of plants purporting to be the poison, two lots have been brought down :—

1. Colonel Northcott's.
2. Captain Donald Stewart's.

1. *Colonel Northcott's Plant*—With regard to this I have before me :—

(*a.*)—Report on Arrow Poison from the West Coast of Africa, by Captain Leishmann, Netley, 21/2/99.

(*b.*)—Report on Arrow-head Poison and Seeds received from Fra Fra District, Mamprusi, Africa, by Major Semple, Netley, December 5th, 1898.

These reports include :—

(*a.*)—Report on leaves.
(*b.*)—Report on seeds of a plant.

In all these cases the respirations ceased before the heart. Whereas in my cases it did not. Again, there is a letter from Mr. Thiselton Dyer, Director at Kew, to Sir Frederick Hodgson, stating the poison in the above reports to be a Strophanthin.

2. *Leaves and seeds brought by Captain Donald Stewart.*—Captain Donald Stewart brought down to Accra from Fra Fra, leaves and a pod with only 3 seeds in it (the others having been all lost) purporting to be the plant from which the arrow poison is obtained. He says that it is abundant in Fra Fra, growing just outside the compounds. I am not certain what their nature is, but they appear to me to be a Strophanthus.

Experiment 1.—A decoction made by boiling the dried leaves in water for half-an-hour and decanting. Equivalent of $\frac{1}{4}$ grain of the dried leaves. No effect after twenty-four hours in a guinea pig.

Experiment 2.—Equivalent of 8 grains of the dried leaves. No effect after twenty-four hours in a guinea pig.

Experiment 3.—Equivalent of 12 grains of the dried leaves. No effect after twenty-four hours.

In these experiments the poison was administered hypodermically.

I did not possess sufficient seeds to make a tincture or decoction, and therefore did not do any experiment with them. Thus my few experiments with the leaves brought down by Captain Donald Stewart produced negative results.

3. *Experiment with Tincture of Strophanthus.*—To test whether strophanthus acted upon guinea pigs I performed the following experiments :—

Two ounces of tincture of strophanthus were evaporated down to 10 c.c., and this was hypodermically injected into a guinea pig.

The animal died slowly in twenty-two minutes, without any of the symptoms of the arrow poison, from failure of the heart. The *post mortem* showed that the musculature of the heart did not react to stimulation, and death appeared to be due to the action of the poison upon the heart's musculature or ganglia. There was a difference between the symptoms of the strophanthus poison and that of the arrow poison, and I consider that they are different poisons.

4. *Dr. Sims Woodhead's report on Uganda Arrow Poison.*—The action of the arrow poison which I possessed upon guinea pigs appears to me to be identical, or nearly so, with that of the Uganda arrow poison, *e.g.*, signs of weakness, retchings, twitching of neck and face, rapid death; spasmodic respiration, antidotal action of large doses of strychnine.

Again, he says in most of his experiments the respiration stopped before the heart, but this was not invariably the case, and he quotes Arnaud as maintaining that the poison acts upon the heart, and Fraser and Tillie say the same, also pointing out a secondary effect on the central nervous system in large doses.

Now Dr. Sims Woodhead knows that his poison is acokantherin, a poisonous principle derived from the trees of the genus acokanthera, (Toxicophloea) belonging to the Apocynaceæ, and it appears to me, from the experiments I have conducted, that the poison on the arrows I possess must be closely allied to that poisonous principle.

My experiments, however, differ from theirs in that the action of the poison absorbed from an arrow inserted under the skin is upon the central nervous system, and not upon the heart direct, and that it causes death through its action upon the cardiac centre, and in support of this I draw attention to the disturbance of respiration, and to the vomiting, (and possibly a vasomotor disturbance) both centres being closely placed in the region of the medulla.

There is also another point of difference, that a decoction of the poison in warm normal saline solution, filtered and treated with absolute alcohol, did not form a precipitate, and did not reduce Fehling's solution.

IX.—Conclusion.

I consider the poison of the arrows I have experimented with to be allied to Acokantherin, and that it causes death by cardiac failure, brought about by its action upon the cardiac centre in the medulla oblongata.

From experiments upon guinea pigs, I suggest that an arrow should be removed at once, and that the wound should be thoroughly filled with a 3% or 6% solution of Permanganate of Potassium, which appears to have an antidotal action if used at once.

These statements are my answers to the two questions mentioned in the Preliminary as the aim of this report.

Time and material have not permitted me to try more experiments than these recorded, though I should have liked to have done so.

X.—Literature at my Disposal.

1. Extracts from a report on Poisoned Native arrows &c.; from Uganda, by Dr. Sims Woodhead, July 30th, 1898.

2. Report on Arrow Poison received from the West Coast of Africa, by Captain Leishmann, February 29th, 1899.

3. Report on Arrow Head poison and seeds received from Fra Fra District, Mamprusi, Africa, by Major Semple, December 5th, 1898.

4. A few experiments upon the Fra Fra Arrow poison by Dr. Chalmers, July 29th, 1899.

THE FIRST PRELIMINARY REPORT UPON THE CULICIDÆ OF THE GOLD COAST COLONY, WEST AFRICA,

BY

ALBERT J. CHALMERS, M.D., F.R.C.S.

November 9th, 1899.

I beg to report that during August, September and October, I have been engaged in collecting, classifying and examining the Mosquitos of Accra, and have thought it useful to forward a series of preliminary reports prior to the full report, which may take a couple of years to complete.

I have been much hampered by the fact that I possess here only one book of reference with regard to Mosquitos, viz.: Ficalbi's "Revisione Sistematica della Famiglia delle Culicidæ Europee." Therefore certain species are left unnamed for the present, pending the arrival of more information from England.

The Mosquitos which I have met with in houses in Accra are:—
1. *Anopheles Pictus*; 2. *Culex Pipiens*; 3. *Culex Modsetus*; 4. *Culex Elegans*; 5. *Culex Richardii*; 6. *Culex Annulatus*; 7. *Magarhina* (species unknown); 8. *Psorophora* (species unknown).

Psorophora was most common during August and September in both European and Native houses.

Culex Pipiens and *Elegans* common during September and October, and up to the time of writing in European and Native houses.

Culex Modestus is now common.

Anopheles Pictus appeared early in October, and I found it first of all in my own bungalow, and was able to trace its origin to a small village, Forna, about 9 miles from Accra on the windward side.

In this village there were hundreds of *Anopheles.*

The village is situate on the coast near the River Sakoom.

I have reared from eggs *Anopheles Pictus, Culex Pipiens* and *Culex Elegans.*

Adda.—From Adda in Adangme I have received specimens of *Culex Modestus.*

Aburi.—From Aburi in Akwapim I received specimens of *Culex Elegans.*

Prampram.—From Prampram in Adangme I received specimens of *Culex Elegans.*

REPORT OF SOME EXPERIMENTS UPON THE PERCENTAGE OF ALCOHOL IN PALM WINE,

BY

ALBERT J. CHALMERS, M.D., F.R.C.S.,

Assistant Colonial Surgeon, Accra.

October 4th, 1899.

Contents.

I.—Preliminary.
II.—Method of Investigations.
III.—List of Distillations.
IV.—Data of Distillations.
V.—Lists of Percentages of Alcohol.
VI.—Remarks.
VII.—Summary.

I.—Preliminary.

In the end of September of this year I was requested by His Excellency Sir Frederick Hodgson, K.C.M.G., the Governor of the Colony, to proceed to Aburi, a small town situate in the hills of the Akwapim district of the Gold Coast, and surrounded by forest, for the purpose of determining the alcoholic strength of Palm Wine.

The method employed by the Natives in obtaining the wine is as follows :—

A tree of the species *Elæis Guineensis* is cut down, the cut down trunk is exposed to the sun and left untouched for a period varying from one to four weeks, according to the ideas of the person to whom the tree belongs. At the end of this time a hole is bored through the top of the tree, about the attachments of the leaves a tube is inserted through this on one side as far as the middle, and hot embers placed in the other half of the boring, and a pot placed beneath the tube for the palm wine to run into. *Vide* figures 1, 2 and 3.

According to the natives there are three periods in the running of the wine :—

(*a.*)—From 1st to 3rd day—Sweet and good.
(*b.*)—From 3rd to 7th day—Strong.
(*c.*)—From 7th to 14th or 21st day—Bitter.

The last is supposed to cause headache. Often the wine sent to a market is watered.

The fresh wine is drunk by the Natives, but they also keep it in black clay pots in a cool place for a time varying up to twenty-four hours, when it reaches its maximum strength, after which they say it becomes bitter and no longer fit for use.

They begin to drink it in the morning and continue to do so all day, and it is not till night time that it has any evil effect upon them.

The strongest wine is used at the funeral customs and such like ceremonies.

Captain Armitage informs me that in some of the districts he has visited, *e.g.*, the Sefwhi district, the Natives keep the wine as long as a week in the pot and then use it, but this is not the custom in the Akwapim district.

At the bottom of a pot of Palm Wine, which has stood some time, there is always found a yeast comparable to the bottom yeast in beer which consists of a Saccharomyces, and is used as ordinary yeast in making bread.

II.—Method of Investigations.

The method of investigation which I adopted was as follows :—

A specimen of wine was obtained of which these data were known :—

1. The length of time the tree had been cut down.
2. The number of days wine had been drawn from the tree.
3. The time of day at which the specimen was drawn.
4. The time at which it was distilled.
5. The number of hours it had been standing.
6. The temperature of the specimen.

A known quantity was then taken and two-thirds of this was distilled, and the distillate made up to the original quantity with water. The residue was also measured to see if there was any loss.

The temperature of the distillate was taken and a reading obtained on a Sykes' Hydrometer, and then by reference to Sykes' tables, the amount per cent. under proof of the spirit was obtained and the percentage strength calculated out by the formula.

$\frac{100 - x}{1{\cdot}76}$ Percentage of alcohol volume in volume,

where x represents the number of degrees under proof, and 1·76 is the ratio of proof spirit to absolute alcohol.

After allowing the spirit to remain in a bottle in a cool place for 24 hours it was again tested by a Sykes' Hydrometer. I am aware it would have been more satisfactory to have conducted the experiments by means of the specific gravity, but I had no means of so doing, and had only Sykes' Hydrometer available for the work.

III.—List of Distillations.

Specimen A.—1st day of drawing the Wine :—

Specimens were distilled which had been kept—

(*a*) ½ hour ; (*b*) 24 hours.

Specimen B.—4th day :—

(*a*) 8 hours ; (*b*) 24 hours.

Specimen C.—8th day :—

(*a*) 9 hours ; (*b*) 24 hours.

Specimen D.—10th day :—

(*a*) 2 hours ; (*b*) 6 hours ; (*c*) 24 hours.

Specimen mixed from market—Unknown date :—

E.—(*a*) 3 hours ; (*b*) 7 hours ; (*c*) 12 hours.

É.—(*a*) 24 hours ; (*b*) 48 hours.

In all fourteen distillations.

IV.—Data of Distillation.

Distillation No. 1.

Specimen A :—

1. Tree had been cut down 8 days before tapping.
2. Palm Wine was drawn for first time.
3. Specimen was drawn at 9.30 a.m.
4. It was distilled at 10.0 a.m.
5. It had been standing $\frac{1}{2}$ hour.
6. Temperature was 81° Fahrenheit.

Quantity distilled was 600 Cubic Centimetres.

After Distillation of $\frac{2}{3}$rds :—

The distillate, after being made up to the original quality, was tested and shewed—

Temperature	78°
Hydrometer	98·4
Reading from tables	98·8 % under proof.

This, calculated out by the formula, gave 0·68 percentage of alcohol volume in volume.

After standing 24 hours in bottle :—

Temperature	75°
Hydrometer	98·4
Reading	98·4

0·90 percentage of alcohol volume in volume.

Distillation No. 2.

Specimen A :—

1. Tree had been cut down 8 days before tapping.
2. Palm Wine was drawn for first time.
3. Specimen was drawn at 9.30 a.m.
4. It was distilled at 10.0 a.m.
5. It had been standing 24 hours.
6. Temperature 74°.

After Distillation :—

Temperature	79°
Hydrometer	94·6
Reading from tables	89·7 % under proof.

This, calculated out by the formula, gave 5·8 per cent. of alcohol volume in volume.

Distillation No. 3.

Specimen B :—

1. Tree had been cut down 8 days before tapping.
2. Palm Wine had been drawn for 4 days.
3. The specimen was drawn at 8.0 a.m.
4. It was distilled at 4.0 p.m.
5. It had been standing 8 hours.
6. The temperature of the specimen was 80°.

Quantity distilled was 600 Cubic Centimetres.

After Distillation :—

Temperature	...	...	...	...	79°
Hydrometer	...	...	...	...	96·0
Reading of tables		...	...	...	93·2 % under proof.

This, calculated out, gave 3·8 per cent. of alcohol volume in volume.

Distillation No. 4.

Specimen B :—

1. Tree had been cut down 8 days before tapping.
2. Palm Wine had been drawn for 4 days.
3. The specimen was drawn at 8.0 a.m.
4. It was distilled at 8.0 a.m. the next day.
5. It had been standing for 24 hours.
6. The temperature of the specimen was 75°.

Quantity distilled was 600 Cubic Centimetres.

After Distillation :—

Temperature	...	...	...	...	77°
Hydrometer	...	...	...	...	95·0
Reading in tables		...	...	...	90·4 % under proof.

This, calculated out by the formula, gave 5·4 per cent. of alcohol volume in volume,

Distillation No. 5.

Specimen C :—

1. Tree had been cut 12 days.
2. Palm Wine had been drawn for 8 days.
3. Specimen was drawn at 8.0 a.m.
4. Specimen was distilled at 5.0 p.m.
5. Number of hours standing, 9 hours.
6. Temperature of the specimen, 79°.

Quantity distilled was 600 Cubic Centimetres.

After Distillation :—

Temperature	...	...	...	...	78°
Hydrometer	...	...	...	...	97·0
Reading of tables		...	...	...	95·6 % under proof.

This, calculated out by the formula, gave 2·5 per cent. of alcohol volume in volume.

After keeping 24 hours in bottle :—

Temperature	...	...	...	...	75°
Hydrometer	...	...	...	...	97·2
Reading of tables		...	...	...	95·6 % under proof.

This gave 2·5 per cent of alcohol volume in volume.

Distillation No. 6.

Specimen C:—

1. Tree had been cut down 12 days.
2. Palm Wine had been drawn for 8 days.
3. Specimen was drawn at 8.0 a.m.
4. Specimen was distilled at 8.0 a.m. the next day.
5. It had been standing 24 hours.
6. The temperature was 76°.

Quantity distilled was 600 Cubic Centimetres.

After Distillation:—

Temperature	...	...	...	...	78°
Hydrometer	...	...	...	...	95·2
Reading by tables	...	...	...	...	91·0 % under proof.

This, calculated out by the formula, gave 5·1 per cent. of alcohol volume in volume.

Distillation No. 7.

Specimen D:—

1. The tree had been cut down 10 days.
2. Palm Wine had been drawn for 10 days.
3. The specimen was drawn at 11.0 a.m.
4. It was distilled at 1.0 p.m.
5. It had been standing 2 hours.
6. The temperature of the specimen was 87° F.

Quantity distilled was one litre.

After Distillation:—

Temperature	...	...	...	...	78° F.
Hydrometer	...	...	...	...	96·2
Reading in the tables	...	...	...	...	93·6 % under proof.

This, calculated out, gave 3·6 per cent. of alcohol volume in volume.

After standing 24 hours in bottle:—

Temperature	...	...	...	...	75° F.
Hydrometer	...	...	...	...	96·4
Reading in the tables	...	...	...	...	93·6 % under proof.

Calculation gave 3·6 per cent. of alcohol volume in volume.

Distillation No. 8.

Specimen D:—

1. Tree had been cut down 10 days.
2. Palm Wine had been drawn for 10 days.
3. Specimen was drawn at 11.0 a.m.
4. Specimen was distilled at 5.0 p.m.
5. It had been standing 6 hours.
6. Temperature of specimen was 88° F.

Quantity distilled was 950 Cubic Centimetres.

After Distillation :—

Temperature	...	...	...	...	78° F.
Hydrometer	...	...	...	...	94·2
Reading in the tables	...	...	...		88·4 % under proof.

This, calculated out, gave 6·5 per cent. of alcohol volume in volume.

Distillation No. 9.

Specimen D :—

1. Tree had been cut down 10 days.
2. Palm Wine had been drawn for 10 days.
3. Specimen was drawn at 11.0 a.m.
4. Specimen was distilled at 11.0 a.m. next day.
5. It had been standing 24 hours.
6. Temperature of the specimen 76° F.

Quantity distilled was 500 Cubic Centimetres.

After Distillation :—

Temperature	...	...	...	...	79° F.
Hydrometer	...	...	...	...	95·0
Reading from tables	...	...	...		90·7

This, calculated out, gave 5·2 per cent. of alcohol volume in volume.

After standing 24 hours in bottle :—

Temperature	...	...	...	...	75° F.
Hydrometer	...	...	...	...	95·2
Reading from tables	...	...	...		90·5 % under proof.

Calculation gave 5·3 per cent. of alcohol volume in volume.

Distillation No. 10.

Mixed Specimen E :—

1 and 2. Unknown.
3. Specimen drawn at 6.0 a.m.
4. It was distilled at 9.0 a.m.
5. It had been standing 3 hours.
6. The temperature of the specimen was 70·4° F.

Quantity distilled was three litres.

After Distillation :—

Temperature	...	...	...	...	78° F.
Hydrometer	...	...	...	...	95·0
Reading in the tables	...	...	...		90·5 % under proof.

Calculation gave 5·3 per cent. of alcohol volume in volume.

After keeping in bottle for 24 *hours :—*

Temperature	...	...	...	...	76° F.
Hydrometer	...	...	...	...	95·0
Reading in the tables	...	...	...		90·2 % under proof.

Calculation gave 5·5 per cent. of alcohol volume in volume.

Distillation No. 11.

Mixed Specimen E.:—

1 and 2. Unknown.
3. Specimen was drawn at 6.0 a.m.
4. Specimen was distilled at 1.0 p.m.
5. It had been standing 7 hours.
6. The temperature of specimen was 88·8°. F.

Quantity distilled was two litres.

After Distillation:—

Temperature	...	...	...	...	79° F.
Hydrometer	...	...	...	...	94·2
Reading in the tables	...	...	...		88·6 % under proof.

The calculation gave 6·4 per cent. of alcohol volume in volume.

Distillation No. 12.

Mixed Specimen E.:—

1 and 2. Unknown.
3. Specimen was drawn at 6.0 a.m.
4. Specimen was distilled at 6.0 p.m.
5. It had been standing 12 hours.
6. The temperature was 80·2° F.

Quantity distilled was one and a half litres.

After Distillation:—

Temperature	...	...	...	...	78·0 F.
Hydrometer	...	...	...	...	94·4
Reading from tables	...	...	...		88·9 % under proof.

The calculation gave 6·2 per cent. of alcohol volume in volume.

Distillation No. 13.

Mixed Specimen É:—

1 and 2. Unknown.
3. Specimen was drawn at 6.0 a.m., 30/9/99.
4. It was distilled at 6.0 a.m., 1/10/99.
5. It had stood 24 hours.
6. Temperature of specimen was 75° F.

Quantity distilled was one litre.

After Distillation:—

Temperature	...	...	...	...	76° F.
Hydrometer	...	...	...	...	95·0
Reading from tables	...	...	...		90·2 % under proof.

The calculation gave 5·5 per cent. of alcohol volume in volume.

After keeping 24 hours in bottle :—

Temperature	75° F.
Hydrometer	94·8
Reading from tables	89·5 % under proof.

Calculation gave 5·9 per cent. of alcohol volume in volume.

Distillation No. 14.

Mixed Specimen É. :—

1 and 2. Unknown.
3. Specimen was drawn at 6.0 a.m., 30/9/99.
4. Specimen was distilled at 6.0 a.m., 2/10/99.
5. It had stood 48 hours.
6. The temperature of the specimen was 75° F.

Quantity distilled was 600 Cubic Centimetres.

After Distillation :—

Temperature	75° F.
Hydrometer	95·2
Reading from tables	90·5 % under proof.

The calculation gave 5·3 per cent. of alcohol volume in volume.

V.—List of Percentages of Alcohol.

A.—List of strengths in order :—

0·68, 2·5, 3·6, 3·8, 5·1, 5·3, 5·3, 5·3, 5·4, 5·8, 5·9, 6·2, 6·4 and 6·5.

Average strength of 14 distillations of various ages is 4·8 per cent. of alcohol volume in volume, and they vary from 0·68 per cent to 6·5 per cent.

B.—List of strengths classified according to the length of time the Palm Wine has stood after tapping :—

½ hour	0·68
2 hours	3·6
3 „	5·3
6 „	6·5
7 „	6·4
8 „	3·8
9 „	2·5
12 „	6·2
24 „	5·3, 5·9, 5·4, 5·8, 5·1
48 „	5·3

C.—List of strengths according to day of tapping :—

1st day rises from 0·68 to 5·8 by keeping.
4th day rises from 3·8 to 5·4 by keeping.
8th day rises from 2·5 to 5·1 by keeping.
10th day rises from 3·6 to 5·2 by keeping.

D.—List of strengths according to length of time between cutting down of the tree and the first tapping :—

8 days rises from 0·68 to 5·8 by keeping.
8 days rises from 3·8 to 5·4 by keeping.
10 days rises from 3·6 to 6·5 by keeping.
12 days rises from 2·5 to 5·5 by keeping.

Remarks.

Palm Wine appears to me to somewhat resemble beer in alcoholic strength.

The alcoholic strength of beer as given in Notter and Firth's "Theory and Practice of Hygiene" is as follows :—

Burton Ale	5·90 %
Scotch Ale	8·50 %
Bass' Ale XX	4·43 %
Cheap Draught Ale	3·00 %
Ditto	3·00 %
Cheap Draught Porter	3·00 %
Ditto	3·50 %
Berlin Ale	7·60 %
Belgium Faro Ale	4·90 %
Bock Beer	4·20 %
Lager Beer	3·90 %
Bavarian Beer	3·50 %
Vienna Beer	3·50 %

While they say that the alcohol varies from 1 to 10 per cent. in volume.

At the end of 24 hours Palm Wine is about 5·5 per cent., and it varies from 0·68 to 6·5 per cent.

The strength of Palm Wine appears to me to depend upon several factors.

1. The number of days during which Palm Wine has been drawn from the tree.
2. The length of time the wine has been kept in its pot.
3. The atmospheric temperature and moisture for some time before the tree has been cut down.

I have already given data with regard to 1 and 2, but with regard to 3 I have not precise data to give, but there is supposed to be a difference between the Palm Wine in the middle of the dry season and that in the middle of the rains, it being somewhat weaker in the latter.

Lastly, I regret to say that I am unacquainted with any literature upon the distillation of Palm Wine.

Summary.

I find the alcoholic strength of Palm Wine to be somewhat analagous to that of Beer.

Figure I.

Showing the top of the cut down Palm tree, from which a number of the leaves have been removed by the man with the hatchet. These are seen in the foreground.

The white patch is the exposed hard wood where the boring is going to be made.

Figure II.

Shows the same tree with a boring made from the notch in the upper edge of the white patch to its lower edge through the tree.

Into the lower part of this boring a tube has been inserted, and below this the black clay pot for collecting the Palm Wine will be placed. The upper part of the boring is filled with hot embers and there the wine flows out through the tube into the pot.

REPORT UPON THE JIGGERS OF THE GOLD COAST COLONY, WEST AFRICA;

BY

ALBERT J. CHALMERS, M.D., F.R.C.S.,

Assistant Colonial Surgeon.

In reply to your order for a report upon the Jiggers of the Gold Coast Colony, I beg to state that they arrived in Accra about 15 years ago, being introduced by some natives who came from the Island of St. Thomas, where Jiggers were then plentiful. These people had the small animals embedded in their feet, and from these the eggs came which gave rise to the Jiggers existing here now.

They proved a great pest upon first arrival, forming ulcers on the hands and feet of the natives, who for some time were ignorant of the cause.

Soon, however, they found these sores were due to the animal, and as a result they learned to dig them out when small.

The Jigger is not looked upon here as a very serious matter, and it is rare to see a native with bad ulcers from them, though it must be allowed that they consider Jigger-haunted places as unhealthy, *i.e.*, as injurious to the general system.

Names.—Among the natives of Accra, the Jigger or Chigoe is generally known as "Saint Thomas," from the place from which it was introduced.

Habitat.—Jiggers live in dry sand, but are not equally plentiful all over the Country.

I find that they mainly infect the pig, forming a large mass in the soft tissue just above the toes.

In piggeries, especially near Accra, where the soil is sandy, there are enormous numbers of Jiggers, and these can be easily caught by taking a small pig, tying its feet together and letting it lie on the sand, and then watching carefully for the insects as they jump on the feet and legs. In the sand itself, it is difficult to pick out the insect owing to its small size. If a pig is infected when young, it becomes very lean and often dies.

Method of Distribution.—I look upon the pig as the chief means of keeping alive and of spreading the pest here, it being not nearly so common in cattle, sheep or goats.

Human beings of course spread this insect, but in Accra the pig is more responsible, in my opinion, for keeping up the Jigger race.

Races Infected.—All races of men seem to suffer alike from Jiggers, if exposed to the infection, but the Hausas, Fullanis, &c., *i.e.*, the Mohammedans of Accra suffer rather more than the others from ill effects, *e.g.*, ulcers, &c.

Description.—The description of the little insect is well known, but the drawings are at times rather inaccurate.

The eggs are comparatively large, white in colour, and possess a shell, inside which is a large quantity of food yolk.

Extermination.—The question as to extermination can only be answered by saying that in the present uncivilised and unopened condition of the Colony, it would be impossible, in my opinion, to exterminate these insects.

Prevention of Distribution.—From this Colony ships proceed either southwards to the already infected regions of the Congo, Lagos, Nigeria, or the German or French States, and here no prevention is necessary.

Going northwards, nearly every ship calls at infected ports before leaving for Europe, and all ships carry Krooboys, who are landed on the Kroo Coast before leaving for Europe, and on the outward journey they obtain them at the same place, therefore every ship may be infected before arriving at this Colony and after leaving it.

Therefore, it has not been thought necessary up to the present time to take any steps against people infected with Jiggers going on board a ship.

Again, merchandise is liable to be infected by the eggs.

Lastly, the cold of the temperate climates apparently kills the Jiggers, and it is to Europe that the majority of the vessels return.

If, however, a vessel was to proceed direct from this Colony to India or the uninfected parts of the east, in my opinion it would be necessary, in order to prevent the insect spreading to them :—

(1.) To inspect all persons and animals on board for the insect.

(2.) To prevent the ship using sand ballast.

(3.) To purify the outside of all merchandise (bales, boxes, casks, &c., &c.) by a solution of Perchloride of mercury.

The last is almost impossible.

REPORT ON THE PUBLIC CEMETRIES, 1899.

During the year 1899 the number of burials was 734, including Christians, Mohammedans and Heathen, viz. :—593 in Accra Cemetery, and 141 in Christiansborg Cemetery.

2. In the Accra Cemetery, the Statistics are as follows :—

Heathen	528					
Wesleyans	22	or	Adults	319		
Mohammedans	20		Children	274		
Christians	23					
Total ...	593		Total	...	593	

3. In the Christiansborg Cemetery there have been interred :—

Europeans	6					
Christian Natives	5	or	Adults	74		
Basel Mission	12		Children	67		
Heathen	118					
Total ...	141		Total	...	141	

4. It is of course practically impossible to arrive at a percentage of deaths in regard to the population, owing to there being no registration of births.

5. A large piece of land has been enclosed as an addition to Christiansborg Cemetery.

6. The death rate, I think indicates better sanitary conditions and surroundings.

7. The fees taken in this year amounted to £50. 10s.

(Sd.) W. HASTINGS KELK,
Registrar of Deaths.

No. 3.

CAPE COAST,
9th January, 1900.

SIR,

I have the honour to place before you a report on the Cemetery Department, Cape Coast, for the year ended 31st December, 1899.

2. During the year 324 deaths were registered—185 males, including 7 Europeans, and 139 females.

3. The death rate per month is as follows :—

Month.	Natives.		Europeans.	Total.
	Males.	Females.	Males.	
January	21	11	—	32
February	18	13	—	31
March	9	9	—	18
April	9	10	—	19
May	28	18	2	48
June	10	11	1	22
July	18	13	—	31
August	15	14	2	31
September	14	8	—	22
October	15	13	1	29
November	12	9	—	21
December	9	10	1	20
	178	139	7	324

4. The fees received for graves amounted to £22. 16s. 6d. ; for exclusive Burials £2. 2s. ; for Certificate of Burials 6/-.

5. The Tantray Cemetery is nearly full. The space remaining for burials is about one-third of the ground, and a part of this is even taken up by a large rock. This being the case, I beg to suggest that steps be taken to secure another piece of land for heathen burials at an early date.

6. The new Cemetery at the same Tantray for Christian burials is marked off, and it will be ready for use, no doubt, some time this year.

I have, &c.,

(Sd.) JOS. A. BRITTON,
Acting Registrar of Deaths.

N.B.—The Tantray Cemetery is at present used for Christian and Heathen burials.

THE REGISTRAR OF DEATHS,
ACCRA.